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ABSTRACT

A program developed by the Austin (Texas) Independent School District under a 2-year grant from the National Science Foundation is described and evaluated. The primary objectives of the program were to: interest minority and female students in science; attract these groups to the teaching of science; enrich the elementary school science curriculum; improve teaching skills in the sciences; and increase private sector involvement in the Science Academy, a high school magnet program in science. Components of the grant were: (1) curriculum collaboration; (2) service to the school district; (3) mini-mentorship--a progam in which Science Academy freshmen advised sixth graders; (4) video lesson enrichment; (5) the Science Academy Summer Institute; (6) recruitment efforts; and (7) promotion of private sector involvement. Evaluation indicated that private sector involvement remained extensive. Program efforts resulted in 93 new lessons created for elementary science classes. Recruitment efforts encouraged participation of many students. More than half of the students who participated in the Summer Institute showed increased interest in science. Neither teaching nor mentoring younger students had a significant impact on the Science Academy students' interest in teaching; however, for the younger students, both were successful in generating interest in science. Videotaped lessons were not useful as teaching tools. Four tables and six graphs are included. (SLD)

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National Science Foundation Grant

to

The Science Academy of Austin

1989-90

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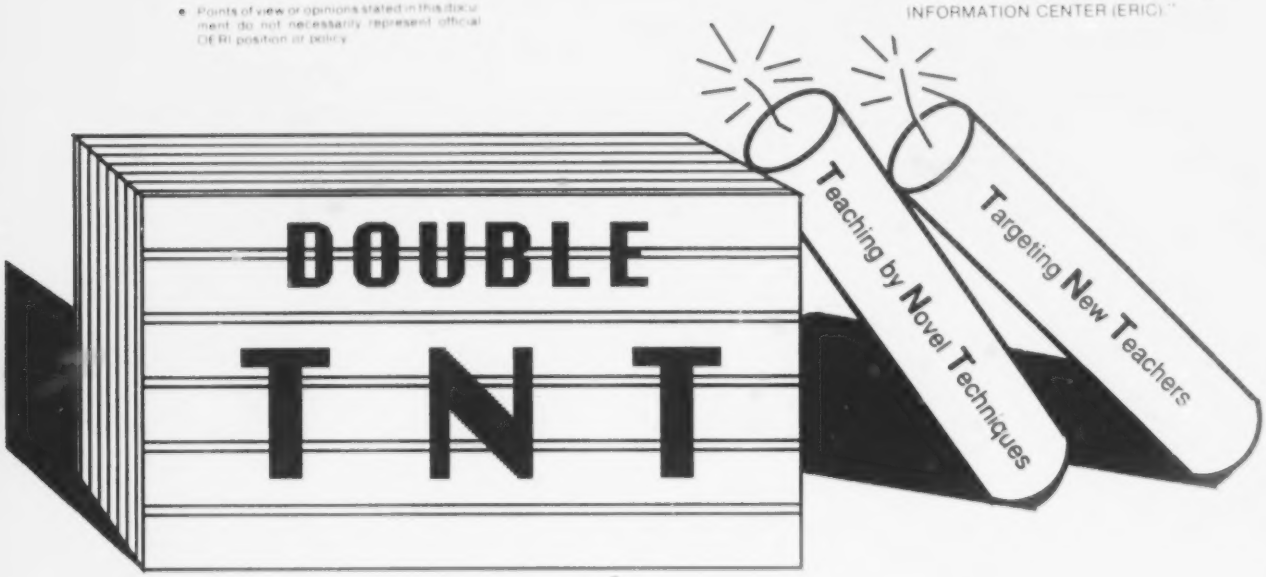

Austin Independent School District

Office of Research and Evaluation

June, 1990

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DOUBLE TNT: TARGETING NEW TEACHERS AND TEACHING BY NOVEL TECHNIQUES

EXECUTIVE SUMMARY

AUTHOR: Lydia Williams-Robertson

Program Description

In 1988-89, the Science Academy of Austin was awarded a two-year grant from the National Science Foundation. The primary objectives were:

- Interesting minority and female students in science,
- Attracting minority and female students to the teaching of science,
- Enriching the elementary science curriculum,
- Improving teaching skills in the sciences, and
- Increasing private sector involvement in the Science Academy.

Six components of the grant were implemented by the Science Academy:

Curriculum Collaboration: High school and elementary teachers created innovative science lessons for elementary students.

Service to the District: Science Academy students taught the innovative science lessons at participating elementary schools.

Mini-Mentorship: Science Academy freshmen acted as mentors and role models for sixth-grade students.

Video Enrichment: Service to the District lessons were videotaped and cataloged for use as teaching tools.

Science Academy Summer Institute: A three-week summer session for middle school students was held to demonstrate that science can be interesting and fun.

Recruitment Challenges: Motivating letters were sent to students who did not quite meet Science Academy admission standards.

Private Sector Involvement: Business and community leaders made many contributions to the Science Academy programs and teaching practices.

Major Findings

1. Private sector involvement remains extensive. A total of 24 companies contributed advice and expertise to the Science Academy, and donations have reached $70,000 this year. Other contributions include staff development, summer employment, and student internships.

2. A total of 93 creative new science lessons were created that were rated as effective by teachers and as fun by elementary students. The collaborating teachers expressed excitement and reported learning new skills.

3. Recruitment efforts reached 59 "almost eligible" students who expressed interest in receiving motivating letters. Almost half (47%) subsequently applied to the Science Academy; 64% of those who applied had raised their ITBS scores sufficiently and were accepted for fall 1990.

4. More than half of the students (53% in Session I, 58% in Session II) participating in the Science Academy Summer Institute reported a positive change in their attitude toward science after attending. The Institute had less impact on attitudes toward mathematics.

5. Neither teaching nor mentoring younger students had a significant impact on the Science Academy students' interest in teaching. For the younger students, both were successful in generating interest in science.

6. Videotaped lessons were not useful as teaching tools, but excerpts will be used in a recruitment video currently in production.

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THE NATIONAL SCIENCE FOUNDATION GRANT TO THE SCIENCE ACADEMY OF AUSTIN

DOUBLE TNT: TARGETING NEW TEACHERS AND TEACHING BY NOVEL TECHNIQUES

FINAL REPORT

PROGRAM DESCRIPTION

THE GRANT

In September, 1987, a proposal from the Austin Independent School District (AISD) to "target new teachers and teach by novel techniques" in the District's Science Academy was submitted to the division of Private Sector Partnerships at the National Science Foundation (NSF). The Science Academy, a magnet program at Lyndon B. Johnson (LBJ) High School, has had a long-standing and beneficial relationship with Austin's academic and business community.

The amount of $338,000 for a two-year period was awarded to the Science Academy by the NSF in order to interest minority and female students in science and in teaching science, to enrich the elementary science curriculum, and to improve teachers' skills in the sciences.

THE COMPONENTS OF THE GRANT

The project components funded by the grant, designed for the 1988-89 and 1989-90 school years, were:

- **Curriculum Collaboration** between high school and elementary teachers to develop lessons that would be used in the Service to the District component and by classroom teachers.

- **Service to the District** by juniors and seniors in the Science Academy. Each was to teach a science enrichment lesson to a class of elementary students in schools with high minority enrollment.

- **Mini-Mentorship** between ninth-grade Science Academy students and sixth-grade students. The students were to be paired for two hours a day for one week in biology or physical science. The freshman mentors were to learn the material and simultaneously teach their sixth-grade partners.

- **Video Enrichment** by videotaping Curriculum Collaboration and Service to the District lessons. The videotapes would be catalogued and copied for use primarily by elementary teachers.

- **Science Academy Summer Institute (SASI)** for AISD teachers and students. After being trained in teaching innovative science or mathematics lessons, the teachers were to practice their skills in summer programs for students going into the seventh, eighth, and ninth grades.

- **Recruitment Challenges** in the form of letters of encouragement, sent to minority students whose standardized test scores were near Science Academy entrance requirements.

- **Private Sector Involvement** to enhance effective teaching practices in all the grant components.

This is a report on the second year of the NSF grant and its implementation at the Science Academy. Context information on Science Academy student composition, achievement, and attrition has continued to be collected and will be published separately.

CURRICULUM COLLABORATION

Overall, the responses of the Curriculum Collaboration writers indicated that they found the collaboration a rewarding experience, learned new skills, and were positive in their assessment of the curriculum's value to both students and teachers. This was supported by the teachers who actually used the lessons, and by elementary students, both of whom rated most of the lessons positively.

THE COLLABORATORS

In the summer of 1989, 19 AISD teachers (11 women and 8 men) collaborated to produce an enhanced science curriculum for elementary students. Although most were elementary teachers, the collaboration included three high school teachers as well.

The purpose of the collaboration was to provide innovative and creative lessons for teachers of first- through sixth-grade classes. The objective of the collaboration was to develop science lessons that would generate excitement and enthusiasm in elementary students.

James Barufaldi, a professor from The University of Texas at Austin, Department of Education, consulted with the curriculum team over the summer. Two additional high school teachers provided hands-on science demonstrations.

THE CURRICULUM

A total of 93 lessons was written for first through sixth grades. Each lesson plan included a concept summary, the activity itself, and a list of materials needed for each activity.

The curriculum was used by the students participating in the Service to the District component of the NSF grant and by 31 elementary teachers in the District.

THE EVALUATION

Surveys were developed and sent to the curriculum writers, the Science Academy students participating in Service to the District, and 31 elementary teachers who received a copy of the lesson book for use in their classrooms.

The Collaborators

"This has been a fantastic opportunity. Out in the trenches, you are often surrounded by 'textbook' teachers. It's nice to know you're not alone in wanting to be different and excite children."

--Curriculum Collaboration Writer

Of the 19 surveys sent, 16 were returned, an 84% return rate. **The writers expressed enthusiasm about the potential of the curriculum.** The writers pointed out that the curriculum would be valuable to students by:

- Offering hands-on experiences (9),
- Providing a wider range of information, activities, and materials than is offered in the current science curriculum (9),
- Generating interest and excitement about science (6), and
- Providing lessons that are interesting and fun (5).

The writers also reported that the curriculum collaboration was a rewarding experience in itself. Aspects of the experience that were valued by the writers included:

- Acquiring new skills/knowledge such as curriculum writing and computer skills (9),
- Sharing ideas and information with peers (6), and
- Providing exciting lessons to use in their classrooms (5).

"I strongly believe that this curriculum will be used!!"

--Curriculum Collaboration Writer

Most of the writers (88%) thought that other teachers would use the curriculum in their classrooms. However, half of those qualified their answers with comments such as:

- "If teachers are introduced to the guide, they will be more likely to use it. If the guide is just given to teachers, without an introduction, it will not be used."
- "Yes, if some of the same writers work together and spread the word about the lessons..."

"Excellent opportunity to enhance my science instruction. I would very much like to do it next year!"

--Curriculum Collaboration Writer

The writers were unanimous in recommending the collaboration as a summer job, and almost all (94%) said that they would like to work on it again next summer. Suggestions for improvement included:

- Establish guidelines for topics and format ahead of time (7),
- Provide more computers and training in computer skills (5),
- Continue to use both primary and secondary teachers (3),
- Keep groups the same size (3), and
- Communicate philosophy and expectations at the beginning (2).

The Teachers

Surveys were sent to the teachers who received the curriculum book, or who participated in Service to the District (N=31). Of these, 17 (55%) were returned. The teachers rated a total of 146 lessons with most teachers rating more than one lesson. **Of the 146 lessons rated, 113 were rated as somewhat or very effective.** Teacher ratings by grade are shown in Figure 1.

FIGURE 1
CURRICULUM COLLABORATION
TEACHER RATINGS

	RATING			
	Ineffective	Neutral	Effective	Total
Grade				
First	12	0	0	12
Second	0	15	5	20
Third	0	1	33	34
Fourth	2	3	51	56
Fifth/Sixth	0	0	24	24
TOTAL	**14**	**19**	**113**	**146**

The lessons most frequently used and rated as effective were the third- through sixth-grade lessons. None of first-grade lessons were rated as effective, but it should be noted that these lessons were used and rated by only one teacher.

The Science Academy Students

Eleventh graders from the Science Academy who used the curriculum lessons while participating in Service to the District were also surveyed. Of the 279 participating students, 45 completed surveys, a return rate of 16%. **Students' responses to the innovative lesson plans were less enthusiastic than those of the teachers, although most (89%) agreed that they enjoyed teaching the lesson.**

In response to the question "The lesson plan was useful and made teaching easy":

- Less than half (44%) agreed.
- A similar proportion (42%) was neutral.
- A small percentage (15%) disagreed.

However, nearly all (91%) of the eleventh graders agreed that the "lesson seemed to be fun" for the third graders. Almost all (93%) of the third graders surveyed reported that they found the lesson interesting.

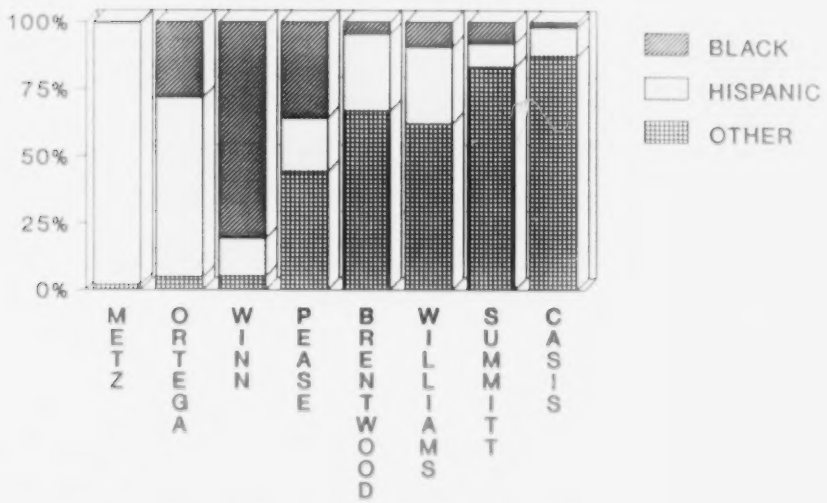
SERVICE TO THE DISTRICT

Overall, Service to the District was successful in generating interest in science and in the Science Academy among elementary students. It was less successful in impacting Science Academy students' interest in teaching. However, the percentage of students expressing interest (13%) is slightly greater than the percentage of students (11%) expressing interest on the districtwide Student Survey.

THE SCHOOLS

Service to the District called for eleventh and twelfth graders at the Science Academy to teach science lessons to elementary students at selected schools. The ethnic composition of the schools served is illustrated in Figure 2. Metz, Ortega, Pease, and Winn Elementary Schools were selected on the basis of their high minority enrollment. Brentwood, Casis, Summitt, and Williams Elementary Schools were selected because curriculum writers teach at these schools.

FIGURE 2
ETHNIC COMPOSITION OF SCHOOLS PARTICIPATING IN SERVICE TO THE DISTRICT



	METZ	ORTEGA	WINN	PEASE	BRENTWOOD	WILLIAMS	SUMMITT	CASIS
BLACK	3	84	412	91	27	85	59	16
HISPANIC	521	201	73	51	167	262	65	82
OTHER	10	14	25	113	391	570	616	674

Each lesson was drawn from the Curriculum Collaboration lesson book and tied to the curriculum and District goals at that grade level. Equipment and materials for some of the lessons were provided by the Science Academy. Some of the students who were taught these enriched lessons took the same lesson home to teach their parents.

THE SERVERS

Approximately 279 Science Academy eleventh and twelfth graders were involved in Service to the District in 1989-90. Students taught several different times during the spring, 1990 semester.

THE SERVED

In all, about 671 elementary students participated in the science lessons taught by Science Academy students. Students from kindergarten through fifth grade participated, although most were in third or fourth grade. Some of the classes were taught more than once.

THE EVALUATION

Surveys were returned by 343 (51%) of the elementary students, 45 (7%) of the Science Academy students, and 16 (52%) of the elementary teachers.

The Science Academy Students

"I wish I had longer to plan out a lesson plan. I really enjoyed this!"

--Science Academy Student

Overall, the Science Academy students surveyed enjoyed working with the third graders, but this did not appear to translate into interest in teaching.

- **Few students (13%) reported that they were interested in teaching before the experience;** a small percentage (15%) reported being more interested following their teaching experience.
- Most (84%) reported no change or less interest in teaching following their experience.
- **In the districtwide Student Survey, only 11% of eleventh graders expressed an interest in teaching as a career.** An even smaller percentage (6%) expressed interest in teaching mathematics or science specifically.
- Nearly all (98%) would encourage the younger children to apply to the Science Academy.
- The vast majority (89%) enjoyed teaching the lesson, and one in three (35%) believed that they would be successful in teaching mathematics or science.

Thus, Science Academy Students did show slightly greater interest in teaching than eleventh graders districtwide. However, this does not appear to be a result of their participation in Service to the District. These students reported that they were interested in teaching before their participation.

The students' suggestions for improving this experience included:

- Knowing the children's grade level ahead of time,
- More organization, detailed information, and preparation ahead of time,
- Smaller groups of children, and
- More clearly communicating the length of time the lesson should be. (Some students thought the lesson was to be much shorter and finished too early.)

The Elementary Students

The third-grade students responded positively to almost all of the survey questions.

- Nearly all liked having the lesson taught by a high school student (92%) and thought that the lesson was interesting (93%). Most (82%) thought it would be fun to teach people.
- A vast majority (84%) liked studying science, and three in four (76%) thought it would be fun to be a scientist.
- Most liked studying mathematics (78%) and thought it would be fun to work with mathematics (77%).
- Most (71%) would like to attend the Science Academy some day.

The Teachers

"The effect of the high school students as positive role models, as teenagers who enjoy science was very powerful, very important!"

--Elementary Teacher

Of the 16 teachers returning surveys, 9 (56%) had classes taught by Science Academy students. **All but one rated their students' response to the lesson as positive.**

Six of the teachers thought that the most effective aspect of the lesson was the positive interaction between the high school and elementary students. Other effective aspects mentioned were:

- The review questions were specific enough to review and reinforce what had been learned previously,
- The materials for some of the lessons were provided,
- The lessons were fun and involving, and
- The students worked with small groups.

Four of the teachers believed no improvement was necessary. Suggestions for improvement from the other teachers included:

- More preparation before the lesson, and
- Preparation of extra material in case the lesson finished early.

Some of the lessons were designed to be taken home and taught to the students' parents. Three of the five teachers whose students took lessons home thought that teaching the lesson had a positive effect on the students. Two did not respond.

The Parents

"She enjoys telling me of what she's learned and how it was done. I like listening to her, and I learn at the same time."

--Parent

Those parents returning surveys (N=26) were enthusiastic about having a lesson taught by their child.

- Nearly all (96%) thought the lesson was interesting and that their child did well on the assignment.
- Almost all (92%) reported that their child seemed pleased after teaching the lesson.

Almost all (96%) responded that they would like more of the lessons. Asked why, their reasons included:

- "Because they are very interesting and the children learn a lot, and my son finds these classes very interesting. Onward!"
- "To me I would like to know more lessons. Because I am learning things that I didn't know."
- "Shows he is listening and learning things."
- "Would help her understand her work a little bit more!"

MINI-MENTORSHIP

Overall, the mentorship experience was a positive one for the participating students. The sixth-grade students enjoyed having the ninth-grade students as mentors, enjoyed the classes, and expressed interest in science and in the Science Academy. The ninth-grade students enjoyed mentoring the younger students, learned new skills, and were unanimous in encouraging them to apply to the Science Academy. Some of the students (14%) expressed interest in teaching.

Science Academy ninth-grade students were paired in a mentor relationship with sixth-grade students from Pearce Middle School while attending science classes at the Science Academy. For two hours each day, over the course of a week, these student pairs shared notes while attending classes, labs, and field trips. The objective was for the older students (especially minorities and women) to act as role models for the younger students and to interest them in science and the Science Academy. In addition, the older students would have an opportunity to teach in a hands-on atmosphere.

THE MENTORS AND THE MENTORED

During the fall, 1989, semester, 160 ninth graders from four Science Academy physical science and biology classes were paired with 104 sixth graders. In addition to attending classes, the student pairs went on field trips to Decker Power Plant and the Greenwater Treatment Plant.

THE EVALUATION

Surveys were completed by 14 of the 160 ninth graders (9%), and by 61 of the 104 sixth graders (59%).

The Ninth-Grade Students

The ninth graders appeared to benefit from working with the sixth graders, but like the eleventh graders who participated in Service to the District, this did not appear to translate into a greater interest in teaching.

- **A few (14%), reported interest in teaching** before **the mentoring experience.**
- **In the districtwide Student Survey, few (8%) ninth graders expressed an interest in teaching.** An even smaller percentage (6%) was interested in teaching mathematics or science.

- The vast majority (86%) enjoyed the mentorship experience.
- Most (79%) agreed that they learned new skills.
- All (100%) would encourage the younger students to apply to the Science Academy.

Thus, Science Academy Students did show slightly greater interest in teaching than the ninth graders districtwide, but again, this does not appear to be a result of their participation in Mini-Mentorship. These students reported that they were interested in teaching before their participation.

The Sixth-Grade Students

Overall, the mentorship experience was a positive one for the sixth graders. All (100%) of the students who responded to the question (five students did not respond) said that they enjoyed having the Science Academy students as mentors.

- Three in four (76%) wanted to attend the Science Academy someday, including:
  - 79% of the Black females responding to the question (N = 19), and
  - 87% of the Hispanic females responding to the question (N = 8).
- The vast majority (82%) liked studying science, and 67% liked studying mathematics.
- **More than three quarters (78%) thought that it would be fun to have a career as a scientist,** including:
  - 85% of the Black females responding to the question (N = 20), and
  - 89% of the Hispanic females responding to the question (N = 9).
- **Almost half (46%) thought they would like to teach,** including:
  - 52% of the Black females responding to the question (N = 21), and
  - 80% of the Hispanic females responding to the question (N = 10).
- Nearly all (95%) thought that the lessons were interesting, and few (16%) thought the lessons were too hard.

THE EFFECT ON SCIENCE ACADEMY TEACHERS

In an interview with the Director of the Science Academy, it was learned that Mini-Mentorship would not be repeated in its present form. Having the sixth-grade students attending classes at the Science Academy for a week (two hours a day) was a great source of stress for the Science Academy teachers. In order to make the classes applicable to the sixth-graders, it was necessary for the teachers to modify radically or abandon current lesson plans for the week of the mentorship. As a result, the classes fell behind in the curriculum, making extra work for the teachers as they tried to "catch up" after the sixth-graders returned to their schools.

VIDEO ENRICHMENT

The Science Academy staff considered the 12 lessons videotaped as unsuitable for use as teaching tools. Excerpts will be used in a Science Academy recruiting videotape currently in production.

The 1988-89 school year was designed to be the pilot year for the video enrichment component of the NSF grant. It was intended that lessons to third graders taught by senior Science Academy students would be videotaped for eventual use in teaching by elementary teachers. In the second year (1989-90), it was proposed that these videotapes be catalogued according to topic and page number of the text in use in the elementary classroom for easy retrieval by teachers.

It was hoped that, not only would these videotapes provide easily accessible resources for enriching the elementary science curriculum, but that they would also furnish a useable record of high school students serving as role models for smaller children.

RESULTS

1988-89

According to the Director of the Science Academy, the results of the pilot year were not what had been wished, but they proved instructive. Of the 11 lessons that took place in the Service to the District program, five were videotaped. For the Mini-Mentorship program, four of the eight lessons were videotaped.

The results were not useful as "teaching tools" and could not match the professional quality of typical teaching films. The videotapes were excellent, however, as documentation of the programs.

The positive interaction between the Science Academy students and the younger students being taught or mentored came across very well in the videotapes. The videotapes also captured teacher involvement in the lessons, and illustrated teaching science by hands-on techniques.

1989-90

During the second year of the grant, three lessons were taped. Currently, plans are to use excerpts from the new and existing videotapes in the recruitment video that is being produced by AISD Media Production Services.

SCIENCE ACADEMY SUMMER INSTITUTE (SASI)

Using creative courses, hands-on techniques, and frequent field trips, SASI demonstrated to participating students that science can be fun. About half of the students reported that SASI had a positive impact on their attitudes toward science, most would recommend it to friends, and nearly all wanted to return next year.

Participating teachers enjoyed the creative freedom, "low-key" approach, and working with motivated students. All reported that they would like to teach at SASI again.

The Science Academy offered a summer program for students who had completed the sixth, seventh, or eighth grades during the summer of 1989. The objective was to offer fun and challenging science courses to these students. Students were required to fill out an application and provide two letters of recommendation from teachers. Although the program was primarily for AISD students, some of the students were from Austin private schools.

The Science Academy Summer Institute (SASI) was held in the summer of 1989. It consisted of two three-week sessions held in June and July. Classes ranged in size from 10-12 students, and were held from 8:00 a.m. - 12:00 noon. Lessons were taught in two-hour classes. Students completed nine lessons by rotating classes every two hours, every two days.

Students also participated in a "Knowledge Contest." Using a game show format, students competed to be the first to answer correctly general knowledge questions.

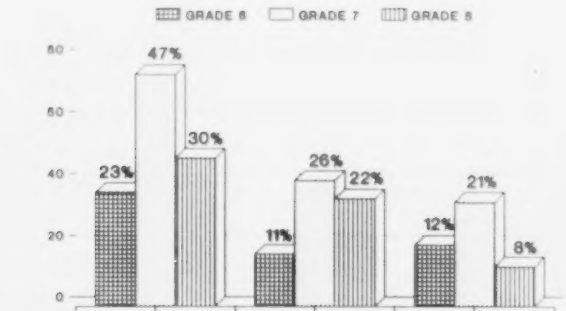
At the end of the session, students were presented with a videotaped "Murder Mystery" instead of a final. After viewing the videotape, students were required to execute a specific task relevant to each of the SASI courses. If they had learned the relevant information from each course, they were able to perform the task correctly and find a clue to the mystery. If they executed each task correctly, they were able to combine all of the clues to solve the mystery.

Prizes donated by local companies were awarded to all winners of the various competitions.

THE STUDENTS

A total of 160 students attended SASI, with 93 students attending the first session and 67 students the second session. Figure 3 shows the number of SASI students from each grade.

FIGURE 3
SCIENCE ACADEMY SUMMER INSTITUTE 1989
STUDENT GRADE LEVEL



	OVERALL	SESSION I	SESSION II
GRADE 6	37	17	20
GRADE 7	75	41	34
GRADE 8	48	36	13

Students were all entering seventh, eighth, and ninth grade, with the largest proportion being entering eighth graders.

Overall, students were distributed evenly by gender, although there were differences across sessions (see Figure 4).

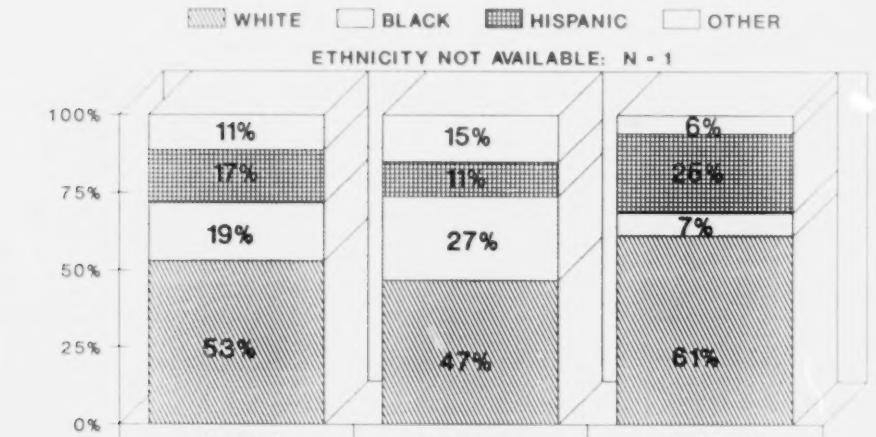
FIGURE 4
SCIENCE ACADEMY SUMMER INSTITUTE 1989
STUDENT GENDER

	OVERALL	SESSION I	SESSION II
FEMALE	76	52	24
MALE	84	41	43

The male population was relatively constant, but there was a larger proportion of female students in Session I than in Session II.

More than half of the SASI students were nonminority (Other). This percentage remained relatively constant across sessions (see Figure 5).

FIGURE 5
SCIENCE ACADEMY SUMMER INSTITUTE 1989
STUDENT ETHNICITY



	OVERALL	SESSION I	SESSION II
OTHER	18	14	4
HISPANIC	27	10	17
BLACK	30	25	5
WHITE	84	43	41

The percentages of Blacks and Hispanics were similar overall (30% and 27%, respectively) although this varied by session. A larger percentage of Blacks attended Session I, while there was a larger percentage of Hispanics in Session II.

THE TEACHERS

Ten teachers were involved in SASI (eight high school and two middle school teachers). Three of the high school teachers were from the Science Academy. Seven of the teachers were science teachers, two were mathematics teachers, and one was a librarian. Nine were responsible for developing and teaching a four-hour science lesson; one was the coordinator and did not teach.

THE COURSES

The nine courses in each session of the Institute were:

- **Outdoor SASI** - The study of the environment, mapping, biological and chemical studies.
- **Shadows, Distance, and Logic** - Solving real-world problems using elementary mathematics and computers.

- **Chemistry** - Making everyday items such as soap, aspirin, etc.
- **Library Skills and Database Research** - Using the computer as a research tool.
- **Making Waves** - The study of the oscillating properties of waves.
- **Rotting Logs** - Biological study of decomposing material.
- **Airborne '89** - The study of flight.
- **Young Engineers** - Demonstrating properties of physics by designing motors to perform specific tasks.
- **Biological Wonders** - Microscopic examination of living organisms.

The weekly field trips were:

Session I

- **Lake Long** - A scientific examination of the life forms of Lake Long and a chemical examination of the water.
- **The Pit Stop** - A trip to investigate a small business and an examination of radio-operated planes and cars.
- **Physics "Circus"** - A tour of The University of Texas at Austin which included a live demonstration of various properties of physics.

Session II

- **Lake Long** - A scientific examination of the life forms of Lake Long and a chemical examination of the water.
- **McKinney Falls** - A biological, ecological, and geographical study of the McKinney Falls area.
- **Chemistry "Circus"** - A tour of The University of Texas at Austin which included a live demonstration of various properties of chemistry.

THE EVALUATION

A survey composed of open-ended questions was developed to evaluate teacher impressions of SASI. All nine of the SASI teachers completed a survey.

Another survey, composed of both open-ended and forced-choice questions, was administered to the 160 students attending SASI. However, for Session II, the survey was modified; therefore, some of the questions were only included in one of the surveys. Where this occurred, responses were tallied and considered separately. However, some of the questions were common to both surveys, and these data have been combined.

There were 93 students registered for the first SASI session. Of these, 81 completed and returned surveys for a return rate of 87%. Sixty-seven students attended the second session, 45 of them completing surveys for a return rate of 67%.

The Teachers

Almost all teacher responses reflected positive attitudes, with the only negative comments focusing on logistical and scheduling preferences.

- Seven teachers mentioned the camaraderie and teamwork of the staff.
- Six teachers mentioned enjoying working with the students.
- Six teachers mentioned enjoying the "creative freedom" and the "low-key" approach.
- Other aspects that were each mentioned by one teacher were the excellent equipment, the field trips, and small class size.

The teachers also appeared to benefit from participating in SASI. Three reported that they would return to their classes with an improved attitude and would incorporate aspects of SASI into their classrooms.

- Five reported that they would increase hands-on/cooperative activities in their lesson plans.
- Two reported that they would use the Knowledge Contest in their classes.
- Emphasizing female participation in science and maintaining rapport were each mentioned by one teacher.

Suggestions to improve SASI included:

- Gaining more recruitment support,
- Revising the class schedule,
- Raising the salary to cover overtime,
- Increasing advance preparation, and
- Improving the screening process to eliminate unmotivated students.

The teachers were unanimous in agreeing that they would like to teach at SASI again and that they would recommend it to other teachers. One teacher added, "But not too enthusiastically, I want the job next year!"

SASI instructors were also asked what advice they would give incoming instructors. All agreed that the teachers in the Institute received administrative support. Suggestions included:

- "Be creative,"
- "Have fun," and
- "Prepare a variety of lesson plans."

The Students

Students were asked for their ratings of the classes and field trips, as well as their assessment of the SASI experience and its impact on their attitudes toward mathematics and science.

It appears that SASI had a positive effect on students' attitudes toward mathematics and science. When asked if SASI changed their opinion of science, 53% (43) in Session I and 58% (26) in Session II responded "yes." Asked to give their reasons for the change in attitude:

- Twenty-two Session I students and five Session II students responded that SASI broadened their knowledge of science and its applications.
- Ten students each from Sessions I and II saw science as interesting and fun.
- Seven Session I students said that SASI stimulated them to learn more.
- Seven Session II students responded that they "like science more."
- Two Session I students indicated that they would consider science as a career choice.

The Courses

Students were asked to rate SASI classes and field trips (see Figure 6). It should be noted that the endorsements for the first session include the field trip, while those for the second session do not.

Students in both sessions were also asked to suggest additions to the SASI curriculum. The classes or field trips most frequently suggested were:

- Discovery Hall or other museums (9),
- NASA (7),
- Astronomy (5),
- Life science (4),
- Computer class (4), and
- Trip to a high tech company or lab (4).

Students in both sessions were asked in what way SASI was better than regular science courses. The students responded in a variety of ways, some responding that it was not better (7), others mentioning the faster pace (2), and some the small class size (5). The positive aspects most frequently mentioned were:

- More fun than regular courses (45),
- More hands-on participation (25),
- No homework, or tests (21), and
- Field trips (8).

FIGURE 6
SCIENCE ACADEMY SUMMER INSTITUTE 1989
CLASS RATINGS

MOST INTERESTING

SESSION I (N = 93)		SESSION II (N = 67)	
CLASS/TRIP	ENDORSEMENTS*	CLASS	ENDORSEMENTS
Physics "Circus"	55	Chemistry	19
Young Engineers	15	Young Engineers	18
Outdoor SASI	14	Biological Wonders	5

LEAST INTERESTING

SESSION I		SESSION II	
CLASS/TRIP	ENDORSEMENTS	CLASS	ENDORSEMENTS
The Pit Stop	38	Rotting Logs	10
Rotting Logs	28	Airborne '89	7
Airborne '89	10	Making Waves	7

TAUGHT THE MOST

SESSION I		SESSION II	
CLASS/TRIP	ENDORSEMENTS	CLASS	ENDORSEMENTS
Lake Long	27	Young Engineers	19
Young Engineers	21	Making Waves	11
Physics "Circus"	18	Chemistry	6

TAUGHT THE LEAST

SESSION I		SESSION II	
CLASS/TRIP	ENDORSEMENTS	CLASS	ENDORSEMENTS
The Pit Stop	41	Airborne '89	16
Rotting Logs	18	Biological Wonders	6
Airborne '89	10	Rotting Logs	6

MOST DIFFICULT

SESSION I		SESSION II	
CLASS/TRIP	ENDORSEMENTS	CLASS	ENDORSEMENTS
Lake Long	27	Making Waves	9
Shadows, Distance, and Logic	10	Young Engineers	7
Young Engineers	10	Rotting Logs	7
		Chemistry	7

MOST FUN**
SESSION I

CLASS/TRIP	ENDORSEMENTS
Physics Circus	49
Lake Long	17
Young Engineers	15

* Many students endorsed more than one course.
** Was not included on Session II survey.

Students in both sessions were asked to suggest improvements. Some (27) students felt that no improvement was necessary. The most frequently mentioned improvements were:

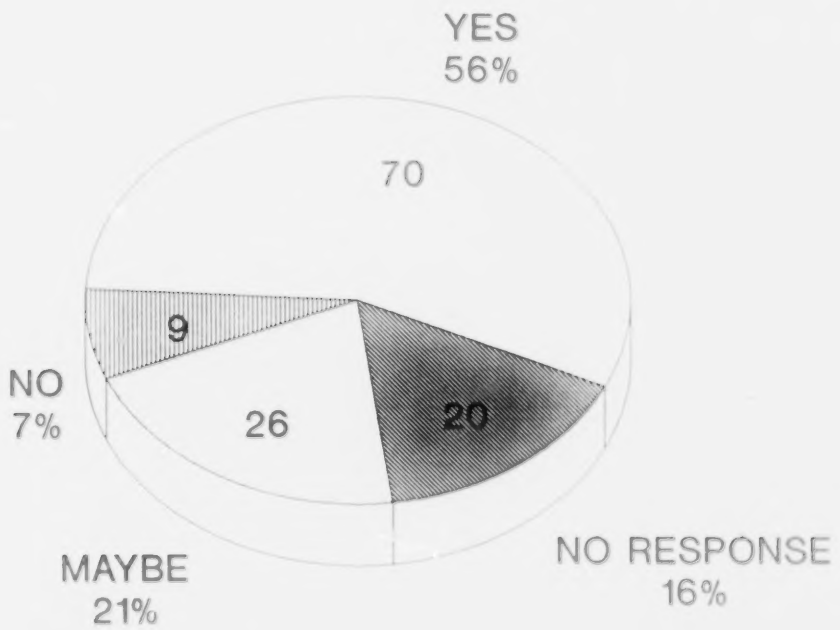
- Changing the classes or field trips (23),
- Making schedule adjustments (15),
- Providing more field trips (9), and
- Adjusting the rules of the Knowledge Contest (9).

When first-session students were asked about the length of SASI, 59% of the students (48) preferred the three-week sessions.

Most students (83%) would recommend SASI to friends, and nearly all (92%) would like to return next year. However, when asked if they would be able to attend if there were a $100 fee for each session, 50% responded that they would not, and 28% responded "maybe." Some (21%) indicated that they would still attend, but it seems likely that charging tuition for SASI will have a negative impact upon recruitment and attendance.

Survey responses indicated that SASI was successful in generating interest in attending the Science Academy. **More than half (56%) of the students expressed interest in attending the Science Academy** (see Figure 7).

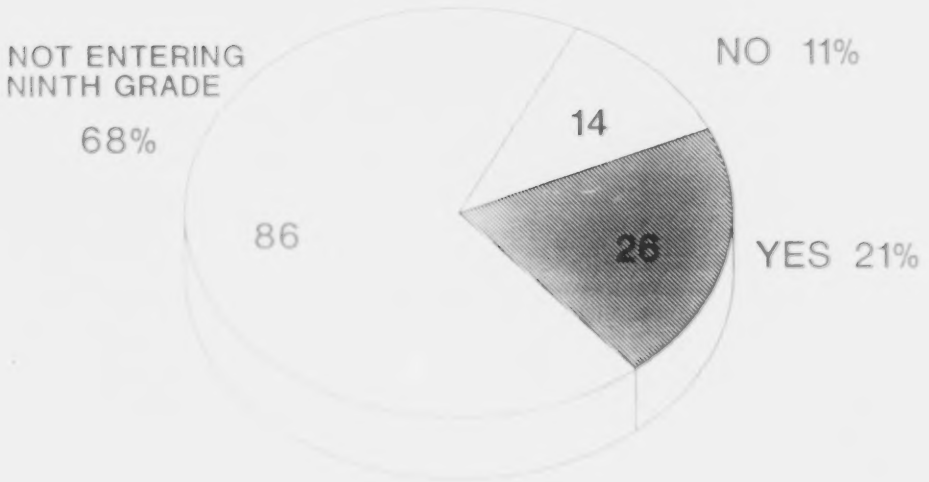
FIGURE 7
SCIENCE ACADEMY SUMMER INSTITUTE 1989
WOULD YOU LIKE TO ATTEND THE SCIENCE ACADEMY?



89.27

The final question on the survey asked entering ninth graders (other students were instructed to skip the question) if they were enrolled in the Science Academy for the fall (see Figure 8). Of the 40 students who responded, 26 were enrolled for the fall.

FIGURE 8
SCIENCE ACADEMY SUMMER INSTITUTE 1989
ARE YOU ENROLLED IN THE SCIENCE ACADEMY FOR FALL, 1989?



RECRUITMENT CHALLENGES

Recruitment Challenges targeted students (especially minorities) with standardized test scores just below Science Academy eligibility requirements. A total of 166 motivating letters was sent to 59 of these students. Of these, 18 students (11 of them were minorities) raised their scores, applied, and were accepted by the Science Academy for 1990-91.

Along with teacher recommendations, scores from the Iowa Tests of Basic Skills (ITBS) are the principal means of determining eligibility for the Science Academy for entering ninth graders. To be accepted to the Science Academy, a student's combined mathematics and reading percentile scores must be at least 140, with a mathematics subscore of at least 60, and all other subscores at least 50.

However, according to the Achievement Profiles for 1988-89, the median ITBS scores for minority seventh-grade students were considerably lower than for Other students. Districtwide median percentile scores, by ethnicity, are shown in Figure 9.

FIGURE 9
DISTRICTWIDE MEDIAN ITBS PERCENTILE SCORES 1988-89

	ETHNICITY		
TEST	Black	Hispanic	Other
Mathematics	23	31	63
Reading	28	34	65
Combined	51	65	126

This disparity in achievement scores limits the number of minority students eligible to attend the Science Academy and thus makes them a target for special recruitment efforts.

The Recruitment Challenges component was a concerted letter-writing effort to encourage those students whose seventh-grade ITBS scores (Figure 10) were below standard to strive to meet testing requirements for the Science Academy in the eighth grade.

FIGURE 10
POSSIBLE EIGHTH-GRADE APPLICANTS TO THE SCIENCE ACADEMY BASED ON 1988-89 ITBS SCORES

CATEGORY	TOTAL	%
ELIGIBLE STUDENTS (Combined scores = 140+ and mathematics subtest = 60th+ %ile and other subtests = 50th+ %ile)	929	(25%)
TARGET GROUP 1 (Combined scores = 140+ and mathematics subtest less than 60th %ile and other subtests = 50th+ %ile)	24	(1%)
TARGET GROUP 2 (Combined scores = 110-139 and all subtests = 50th+ %ile)	369	(10%)
POSSIBLES (Combined scores = 110-139 and not all subtests = 50th+ %ile)	210	(6%)
NOT LIKELY (Combined scores = less than 110)	2,151	(58%)
TOTAL NUMBER OF EIGHTH GRADERS WITH 1988-89 ITBS SCORES	3,683	(100%)

The Eligible Students

Of the 3,683 eighth graders in the 1989-90 school year with ITBS scores on file from the previous year (1988-89), 929 (25%) met eligibility standards. A letter of invitation from the Science Academy was sent to each of these eligible students in fall, 1989.

The proportion of male and female students in the eligible group is comparable to the overall distribution. However, the numbers of Blacks and Hispanics are disproportionately small when compared to the overall distribution.

- Only 6% of the eligible students are Black, compared to 21% of eighth-grade students overall.
- Only 14% of the eligible students were Hispanic compared to 32% eighth-grade students overall.

The Targeted Students

Targeted students were taken from two groups; Group 1 (combined percentile scores of at least 140, and with mathematics and reading scores of at least 50), and Group 2 (combined percentile scores from 110-139, and with mathematics and reading scores of at least 50). All of these students (N=382) received motivating

letters. The ethnic distribution of the target group more closely resembled that of the overall distribution, but minorities remain underrepresented.

- Only 12% of the eligible students were Black, compared to 21% of eighth-grade students overall.
- Only 26% of the eligible students were Hispanic, compared to 32% of eighth-grade students overall.

THE CHALLENGES

Early in the fall of 1989, the 393 students in the target group were sent letters of encouragement from the Science Academy. Included in the letter was a request form to be returned if the student wanted to receive additional letters from 19 local business leaders, various professionals, and Science Academy staff and students.

- Fifty-nine students returned request forms.
- A total of 166 motivating letters was sent to these students.
- A group of Hispanic students from the Science Academy made personal visits to those Hispanic students who returned request cards.
- Twenty-eight of the targeted students applied to the Science Academy for the fall of 1990.
- Eighteen improved their ITBS scores and were accepted by the Science Academy, including:
  - Five Black students,
  - Six Hispanic students, and
  - Seven Other students.

PRIVATE SECTOR INVOLVEMENT

Since its beginning in 1983, when IBM originated the idea of a mathematics and science high school in the Austin Independent School District, private sector involvement in the Science Academy has continued to grow. There are currently 24 companies who lend their advice and expertise to the Science Academy.

Private sector involvement in the Science Academy included:

Donations $70,000 (Direct and In-Kind)

- Computer software and hardware
- Electronic components
- Electronic work stations
- Nova scholarships
- Networking of a lab
- Office equipment

Staff Development

- Three-day faculty retreat (August, 1990)

Guest Speakers and Presenters

- Austin Diagnostic Clinic
- The City of Austin
- Earth First
- Greenpeace
- IBM
- Lockheed
- Motorola
- Seton Hospital
- The Society of Women Gynecologists
- Texaco
- 3M
- The University of Texas at Austin

Summer Employment for Students and Teachers

- Abbott Labs
- IBM
- MCC
- Novell Software, Inc.
- Texaco
- Texas Instruments
- 3M

Student Internships

- Arthur Walker (Law Office)
- Austin Family Medical Center
- Austin Wastewater Treatment Plant
- Burnet Veterinary Clinic
- Clear Clean Colorado
- Hospital Pharmacy
- Motorola
- Radian
- Texas Instruments
- Tracor
- The University of Texas at Austin Law School
- Windsor Veterinary Clinic
- Winn Elementary School

THE ADVISORY BOARD

During 1989-90, 27 professional and business people have continued to serve on the Science Academy Advisory Board. They met monthly or bimonthly with the Science Academy administrative staff, the Executive Director of the Department of Management Information for AISD (DMI), and the Superintendent of the District.

The Board has set policy, placed students in internships and in summer employment in local companies, arranged for field trips and the donation of equipment, provided speakers to Science Academy classes, served as technical advisors for curriculum development and other needs of the Science Academy, and funded staff retreats in the summer.

Advisory Board 1989-90

VAUGHN ALDRIDGE - Regional Director of Government Relations, AT&T
ROBERT BACKLUND - Vice President, 3M
CARLIN BRANDT - Division Manager, Southwestern Bell Telephone
GERALD BRINEY - University Relations Program Manager (Retired), IBM
JERRY M. CARLSON - Vice President and General Manager, IBM
DR. JOHN ELLIS - Superintendent, Austin Independent School District
DR. EXALTON DELCO - Vice President, Austin Community College
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RUDY GARZA - S. A. Garza, Engineers
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DR. ERNEST YEAKEY - Laboratory Director, Texaco Research Labs
SAM J. ZIGROSSI - Manager, Site Education Administration, IBM

INVOLVEMENT IN THE GRANT COMPONENTS

Curriculum Collaboration

James Barufaldi, the Director of the Science Education Center at The University of Texas at Austin, consulted with curriculum collaborators during the summer.

Service to the District

An engineer from IBM assisted Science Academy students with their presentations at an elementary Saturday Science Fair.

Mini-Mentorship

Field trips were arranged by professionals employed by the Decker Power Plant and the Greenwater Treatment Plant.

Video Enrichment

A recruitment videotape utilizing excerpts from the Service to the District lessons (taped last year) is currently being Produced by the AISD Media Production Services.

Recruitment Challenge

Challenge letters to targeted students were written by 19 business leaders, government officers, various professionals, and Science Academy staff and students (Figure 11). Each individual wrote from 5 to 15 letters.

FIGURE 11
ALPHABETICAL LIST OF RECRUITMENT CHALLENGERS

ANDREW BAKER
Science Academy

HON. GONZALO BARRIENTOS
Texas State Senate

J. CARLIN BRANDT
Southwestern Bell Telephone

JERRY M. CARLSON
IBM

ELLIE CLICK
Science Academy

DR. WILLIAM CUNNINGHAM
The University of Texas at Austin

DR. EXALTON A. DELCO
Austin Community College

HON. PHIL GRAMM
United States Senate

MARY LONG
Science Academy

HON. GARRY MAURO
General Land Office

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ProCreate

D. H. PENROSE
Lockheed

D. R. SCARBROUGH
Lockheed

RON SHELLY
Texas Instruments

SYLVIA SIMPSON
Lockheed

EDWARD THOMAS
CompuAdd

R. E. TURNER
Turner Broadcasting System

DR. ERNEST L. YEAKEY
Texaco

SAM ZIGROSSI
IBM

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Austin Independent School District

Department of Management Information
Dr. Glynn Ligon, Executive Director

Office of Research and Evaluation
Systemwide Evaluation
David Wilkinson, Evaluator

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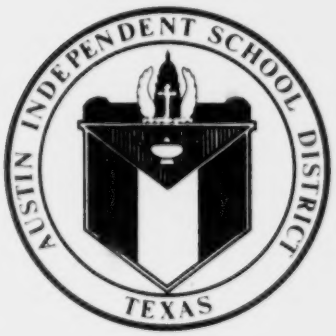
Ruth Fairchild, Secretary



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